

# Breaking Barriers to Literacy across the Lifespan: Perspectives from Audiology, Education, Optometry, and Speech/Language Pathology

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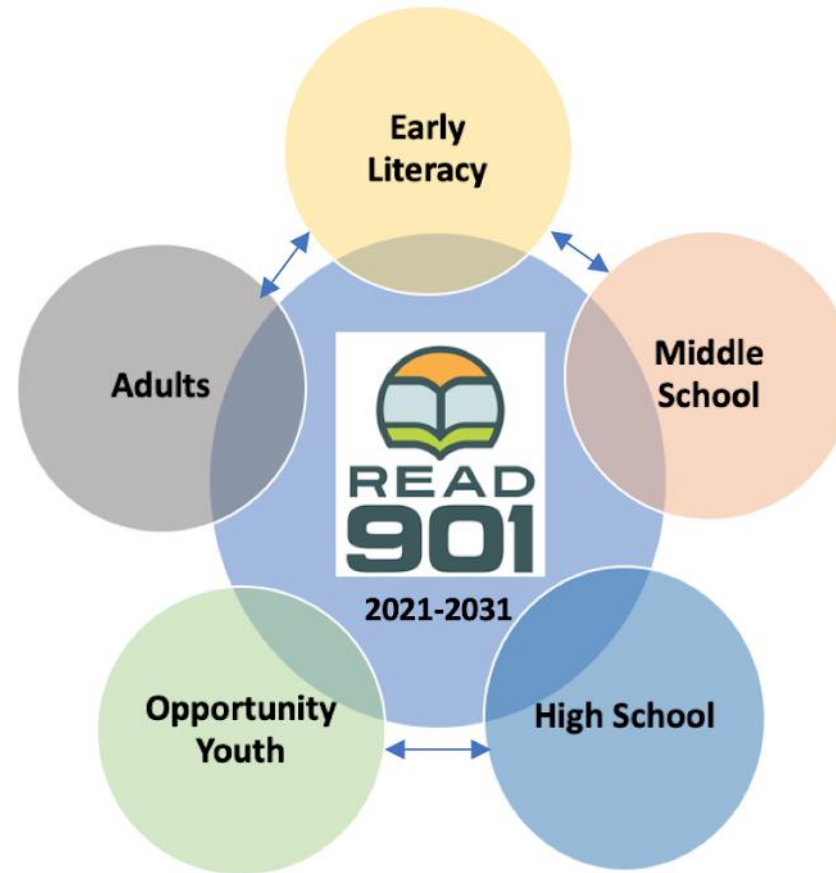
# Literacy Across the Lifespan

A community story.



# Literacy Across the Lifespan

A family story.  
A community story.  
Our story.



Evidence-Informed Strategies

School-Community Instructional Alignment

Multi-Generational Assets-Based Approach

Progress Through Collective Action Across Sectors



# Our Community Resources

<http://infohub.read901.org/>



## Literacy Resources Across the Lifespan

- Early Childhood
- School-Aged
- Opportunity Youth (16 – 24)
- Adult Literacy
- English Language Learners (ELL)



# TN Literacy Crisis

In 2019, 35 percent of fourth-graders and 33 percent of eighth-graders performed at or above proficient on the NAEP reading assessment.

Tennessee student achievement data show that an average of 32.8 percent of students across grade levels are meeting grade level expectations in English Language Arts. (TN DOE, 2018)

# The Science of Reading



There is a clear science to teaching reading.



Thanks to advances in cognitive and neuroscience, we know more than ever about how the brain learns to read.



This science dispels misconceptions about reading and reading instruction that are holding students back.



# Common Misconceptions

Learning to read is a natural process.

Our brains are wired to learn how to read the same way they are wired to learn how to talk.

In order to learn how to read, people just need

- Exposure to books and print
- Enjoyable shared reading experiences
- Lots of reading experiences
- Authentic texts that are interesting to them
- Texts that reflect and affirm their identity

Spelling instruction is unnecessary because kids have spell check.

Handwriting instruction is unnecessary because kids will be typing everything.

Learning to read is an instinctual, natural process.  
FALSE

35 years of research has not supported the view that reading development reflects a *natural process*—that children learn to read as they learn to speak, through natural exposure to a literate environment.

To the contrary, research has shown that certain aspects of learning to read are highly unnatural. (E.g. Identifying phonemes in spoken words and applying them to letters and letter patterns.) (Liberman, 1992).

In the words of psychologist and researcher Dr. Keith Stanovich “ The idea that learning to read is just like learning to speak is accepted by no responsible linguist, psychologist, or cognitive scientist in the research community.” (Stanovich, 1994, pp. 285-286).

Our brain is  
wired to learn  
how to read  
like it is wired  
to learn how  
to talk.  
FALSE

- Human brains are naturally wired to speak; they are not naturally wired to read and write.
- Reading and writing are acquired skills for which the human brain is not yet fully evolved (Liberman, Shankweiler, & Liberman, 1989)
- We are not born with a reading center of the brain.
- In order to read, we have to create an interface in our brain between our visual system and our language system, specifically, the sound system of language (phonology).
- To do this, the brain repurposes a part of the visual system (left occipito-temporal region) that exists for other reasons for the purpose of letter and word recognition and connects that part to the speech and language centers of the brain. (Dahaene, 2009)
- Certain disabilities (dyslexia, auditory/visual processing disorders, etc.) make this process of repurposing and connecting harder. (Dahaene, 2009)
- The brain does not make these changes and connections naturally. (Dahaene, 2009)
- Learning to read changes the brain. (Dahaene, 2009)

In order to learn how to read, kids just need:

- Exposure to books/print
  - Shared reading
  - Interesting and authentic texts
  - Time to read.
- FALSE

- These things are necessary, but not sufficient.
- Explicit instruction in how the written code works is required.
- Children have to actively create the interface between the visual system and the language system.
- Children have to be explicitly taught how to form letters, how to hear the individual sounds in spoken words and map them onto the letters in written words.
- They also have to be explicitly taught spelling rules and patterns.
- They also need to be taught how morphemes work and how they impact spelling.
- They need to practice reading and spelling until they become fluent and automatic.
- “That direct instruction in alphabetic coding facilitates early reading acquisition is one of the most well established conclusions in all of behavioral science.” (Stanovich, 1994, pp. 285-286)

Spelling  
instruction is  
not important  
because  
children can  
just use spell  
check.  
FALSE

- Spell check is imperfect and spelling errors matter.
- Proficiency in spelling actually supports reading (Moats, 2005/2006).
- Accurate spelling requires and reflects more advanced linguistic knowledge than accurate reading because it requires the integration of phonological, orthographic, and morphological knowledge (Ehri, 2000).
- Fluid, automatic spelling allows cognitive resources to be devoted to the content of what is being written.

Handwriting  
instruction is  
not important  
because  
children will  
be typing  
everything.  
FALSE

- The attention to letter form that happens during handwriting instruction can help children as they work to recognize the small differences between letters.
- Labored handwriting creates a drain on mental resources needed for higher-level aspects of writing, such as attention to spelling, content, elaboration of details, and organization of ideas.
- Activities like taking notes, taking tests, and doing classroom work and homework depend on efficient and automatic handwriting skills and legible handwriting.
- When children perceive handwriting to be arduous and slow, they may avoid writing, which may further compound difficulties with spelling and writing.
- Handwriting in the earliest grades is linked to basic reading and spelling achievement. Attention to the linkages among handwriting, reading, and spelling skills can help to reinforce early achievement across these areas. (Pritchard et al, 2020; Longcamp et al, 2016)

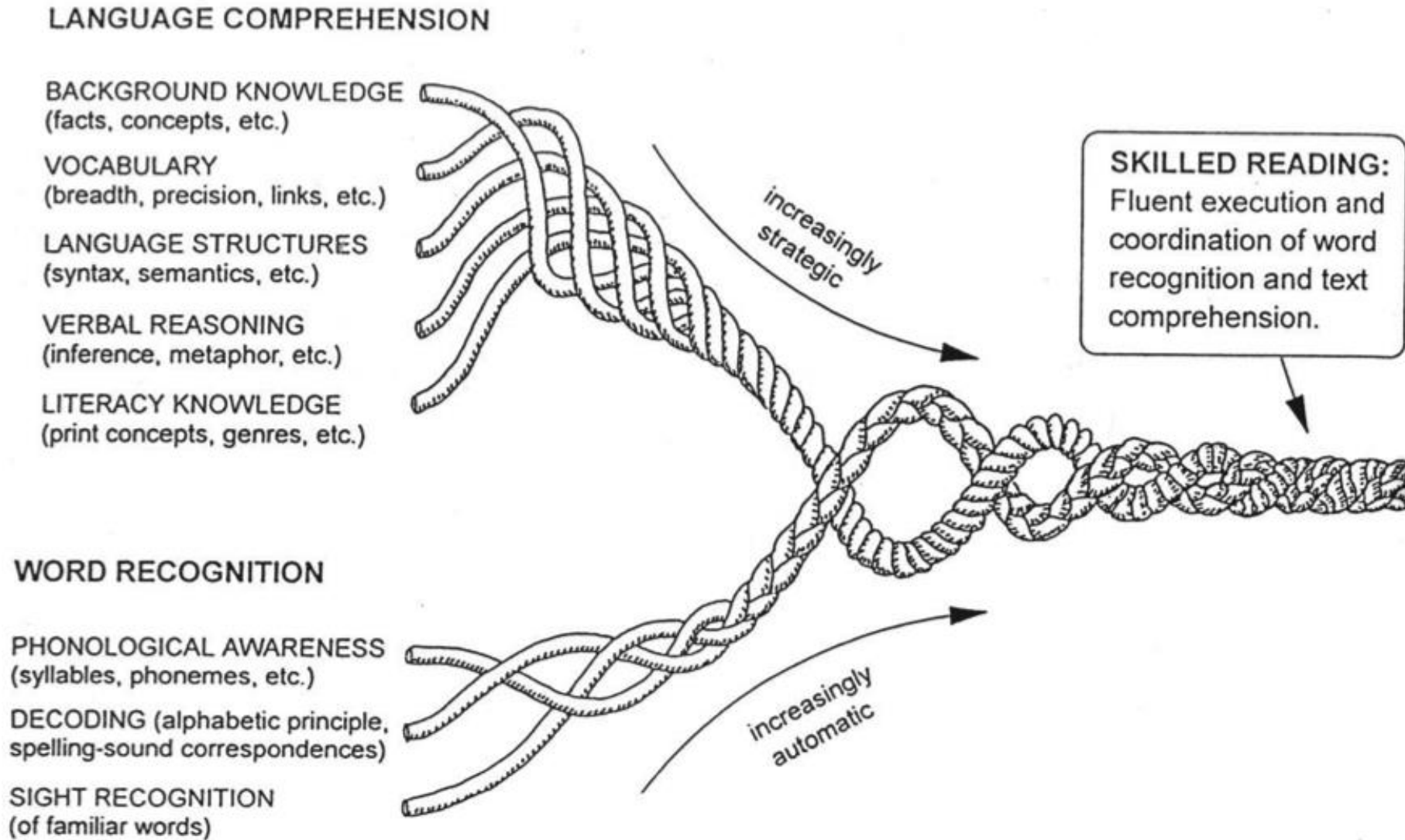
# The Simple View of Reading (Gough & Tunmer, 1986)



Ability to  
read  
individual  
words

Ability to  
understand  
spoken language

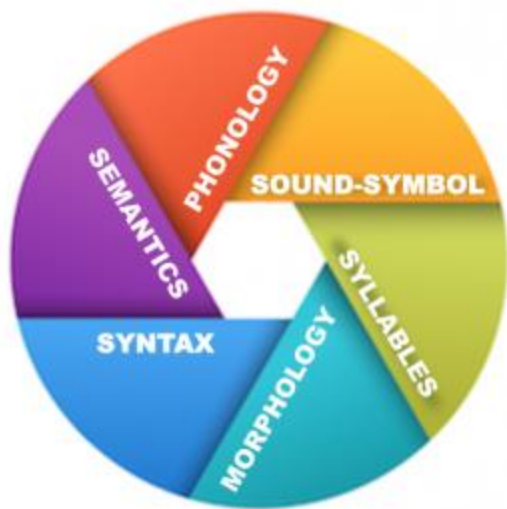
# Scarborough's Reading Rope (2001)





# Structured literacy

Explicit teaching of systematic word identification and decoding strategies



Evidence-based elements

+



Evidence-based teaching principles

=



Effective reading instruction

**Source:** © 2016 Cowen for International Dyslexia Association  
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# The Science of Reading

If you are interested in learning more about the science of reading, there are many excellent resources and trainings. The following are good places to begin to learn about the science of reading.

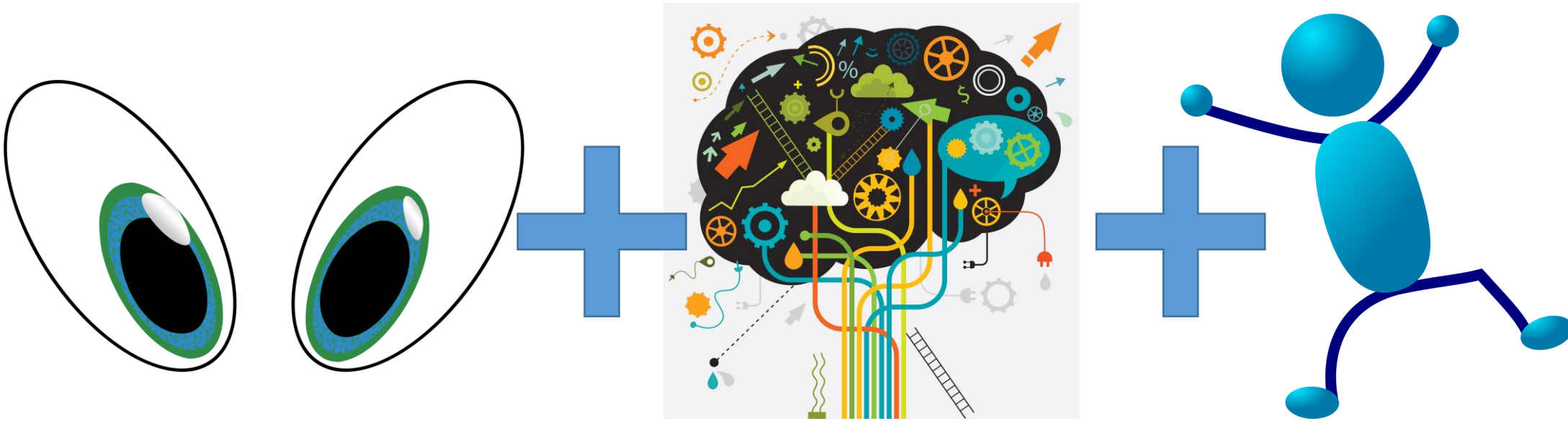
- [Scienceofreadinginfo.com](http://Scienceofreadinginfo.com)
- Reading Rockets Reading 101 (website)
- Zaner Bloser Science of Reading Webinar Series
- Bookworms Webinar Series with Sharon Walpol
- The Science of Reading Podcast by Amplify



# The Visual System



# The Visual System

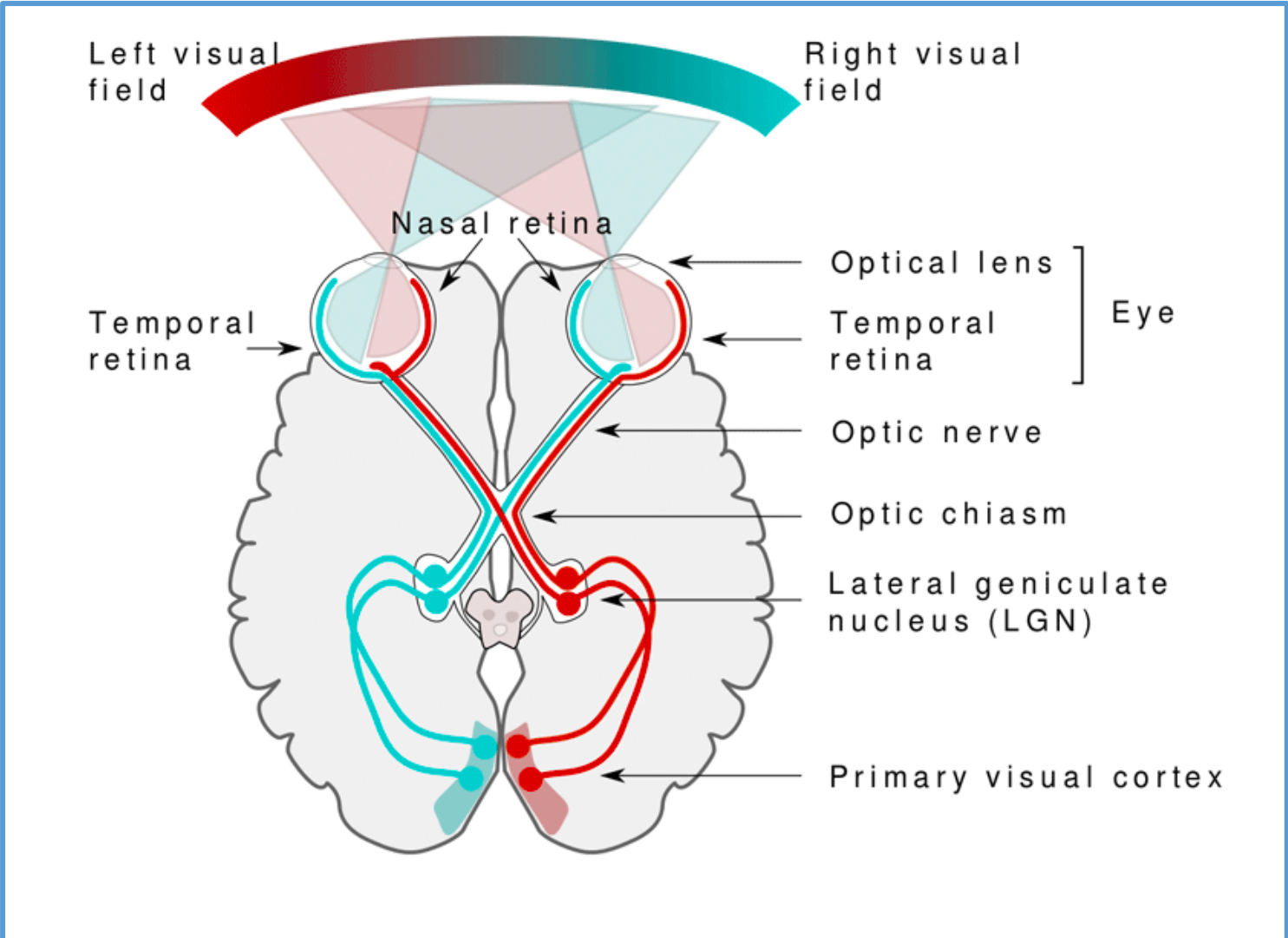


# Building Vision in the Brain

Light collected by the eyes

Travels through the optic nerves

To the occipital lobes



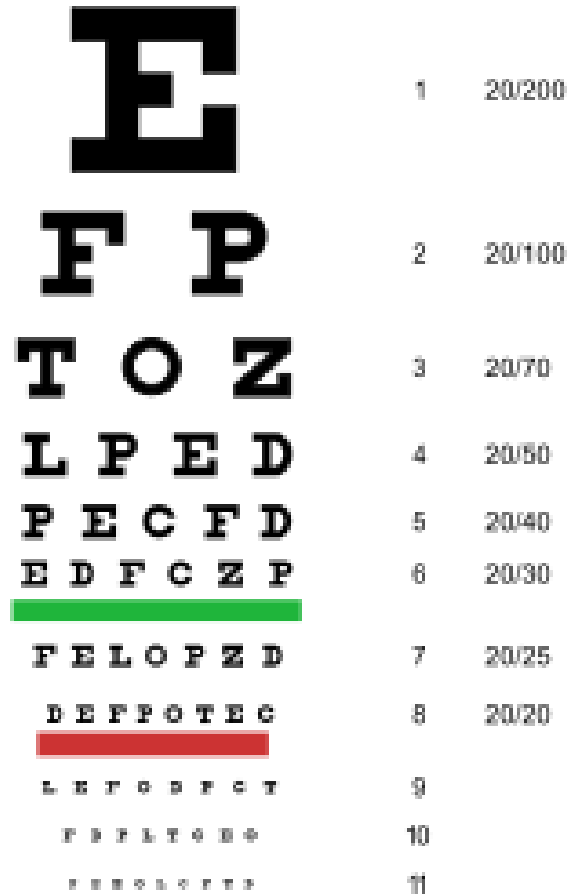
Decisions about what to do with vision made in the frontal lobes

Combined with other sensory inputs in the parietal lobes

Organized in the temporal lobes



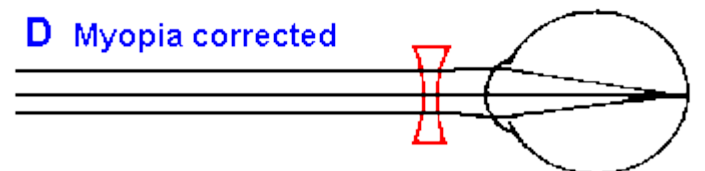
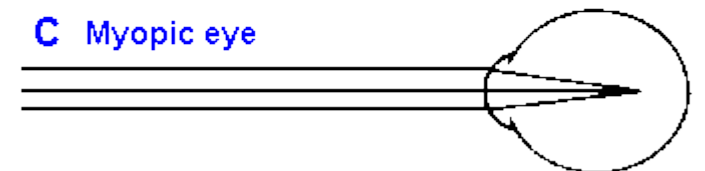
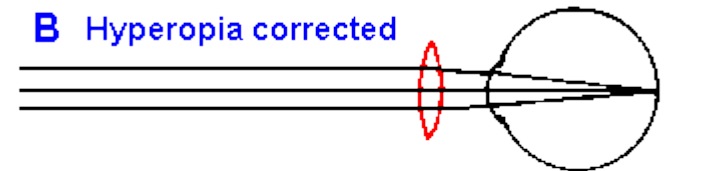
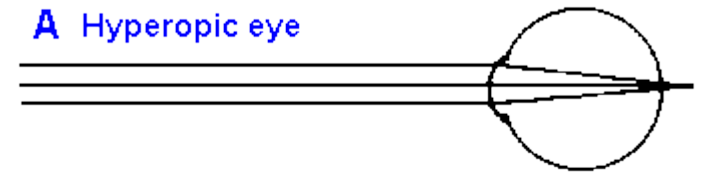
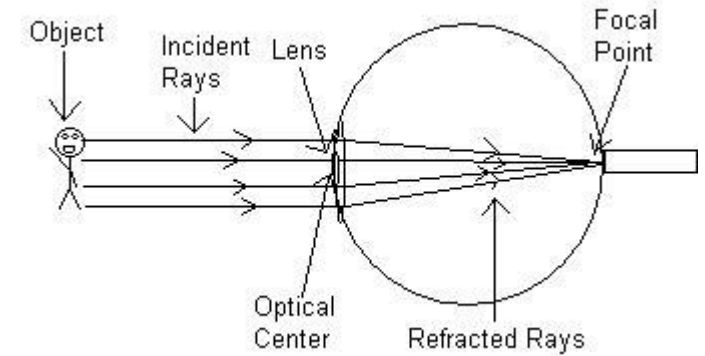
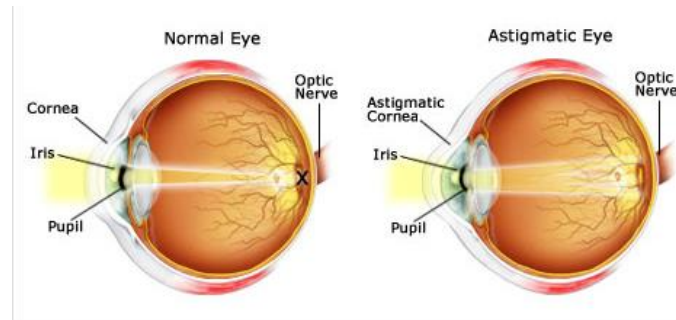
# Visual Acuity



Foot	Meter	Decimal	LogMAR	M	Print Size	Print Example
20/400	6/120	0.05	1.30	8	66 pt font	Newspaper headlines
20/200	6/60	0.10	1.00	4	33 pt font	Sub-headlines; children's books
20/160	6/48	0.125	0.90	3	24 pt font	Large Print Books
20/125	6/38	0.16	0.80	2.5	20 pt font	Books for ages 7-8
20/100	6/30	0.20	0.70	2	16 pt font	Computer display type
20/80	6/24	0.25	0.60	1.6	14 pt font	Grade 1-3 children's books
20/63	6/19	0.32	0.50	1.3	12 pt font	Grade 4-7 children's books
20/50	6/15	0.40	0.40	1	8 pt font	Small column newsprint
20/40	6/12	0.50	0.30	0.8	6 pt font	Want ads; telephone directory
20/32	6/9.5	0.63	0.20	0.6	5 pt font	Small print Bible; footnotes
20/25	6/7.5	0.80	0.10	0.5	4 pt font	Mail order catalogs
20/20	6/6	1.00	0.00	0.4	3 pt font	Medicine bottle labels

# Refractive Conditions

- Myopia: Nearsighted
  - Example Spectacle Prescription (SRx): OD -1.50 DS / OS -1.50 DS
- Hyperopia: Farsighted
  - Ex SRx: OD +2.00 DS / OS +2.00 DS
- Astigmatism: Two focusing points
  - Ex SRx: OD -1.50-1.00x180 / OS -1.50-1.00x180
- Anisometropia: Significant difference in SRx between the eyes
  - Ex SRx: OD -1.50-1.00x180 / OS +2.00 DS
- Amblyopia: Even with best SRx, one eye does not see as well as the other
  - Refractive
  - Strabismic








# Eye Coordination

## Eye Movements

- Developmental timeline
  - OKN response
  - Fixation
  - Horizontal saccades
  - Vertical saccades
  - Smooth pursuit
  - Visually directed reaching

## Eye Alignment

### Tropia v Phoria

	Ortho (aligned)	
	Eso	inward turn of one or both eyes prevalence in general population 1.2%
	Exo	outward turn of one or both eyes prevalence in general population 2.1%
	Hyper	upward turn of one eye prevalence in general population 0.26%
	Hypo	downward turn of one eye



# Visual Processing

- Laterality and Directionality
- Visual-Motor Integration
- Visual Perceptual Skills
- Language Processing
- Visual-Auditory Integration

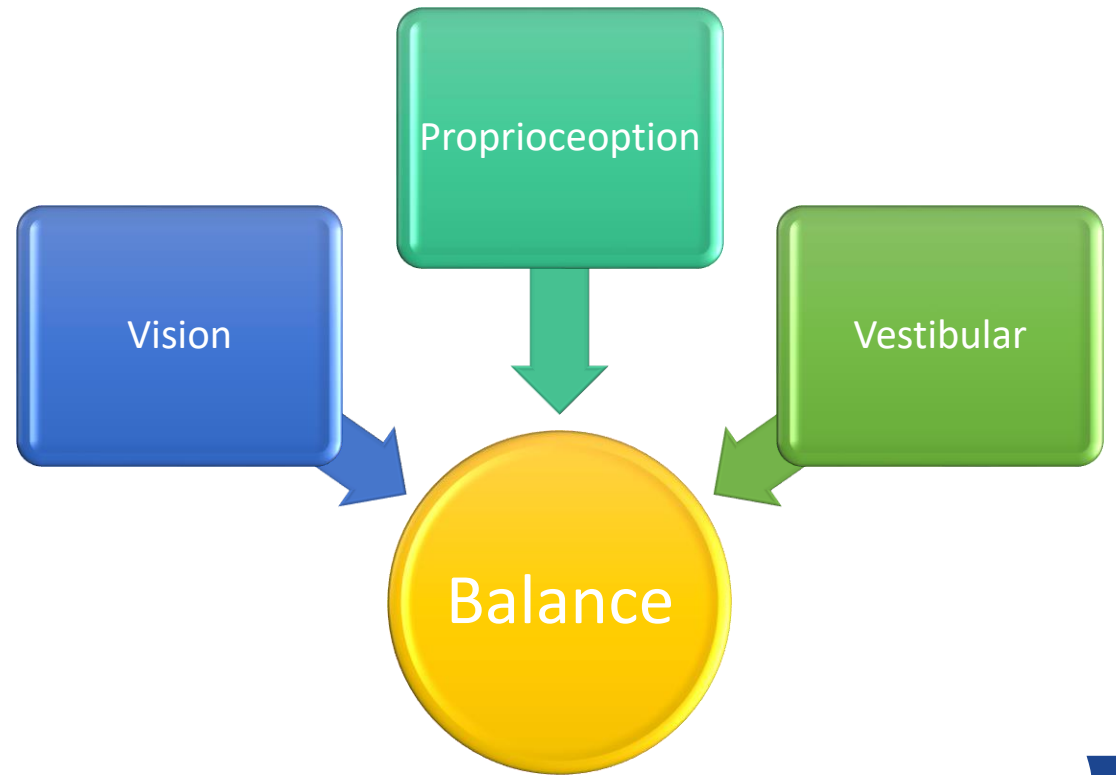


Spot It Card Game

Visual Perceptual Skills	
Discrimination	Discriminate features: size, shape, pattern, position, and orientation
Memory	Retain information presented visually over a period of time
Spatial Relations	Ability to tell where things are in space
Form Constancy	Identify an object even if size or direction is changed
Sequential Memory	Remember a specific sequence of forms
Figure-Ground	Find a form in a visually crowded background
Closure	Interpret incomplete forms

# Vision, Balance, and Movement

- Visuo-motor coordination
  - Attention driven
  - Efficiency – motor memory and learning
- Balance and walking
- Depth Perception
  - 3-D: awareness that objects are not flat
  - Fine depth perception relies on two eyes working together
- Spatial localization
  - Accurately estimating how far objects are from self or other objects



# The Auditory System

# Learning Triangle

## Auditory

Registers sounds that create awareness of spatial information around us

Alerts us to sounds that draw attention and guides our vision

Incorporates rhythmic sounds to organize and promote movement



## Vestibular - Motor Skills

## Vision

Acts as an warning system that alerts us to movement with our visual field

Integrates all our sensory and motor processing information

Provides visual perception skills for planning, organizing and modifying behavior

## Vestibular

Monitors orientation of the head in a gravity-stabilized environment

Registers movement and anchors us in place

Incorporates movement information with all our senses

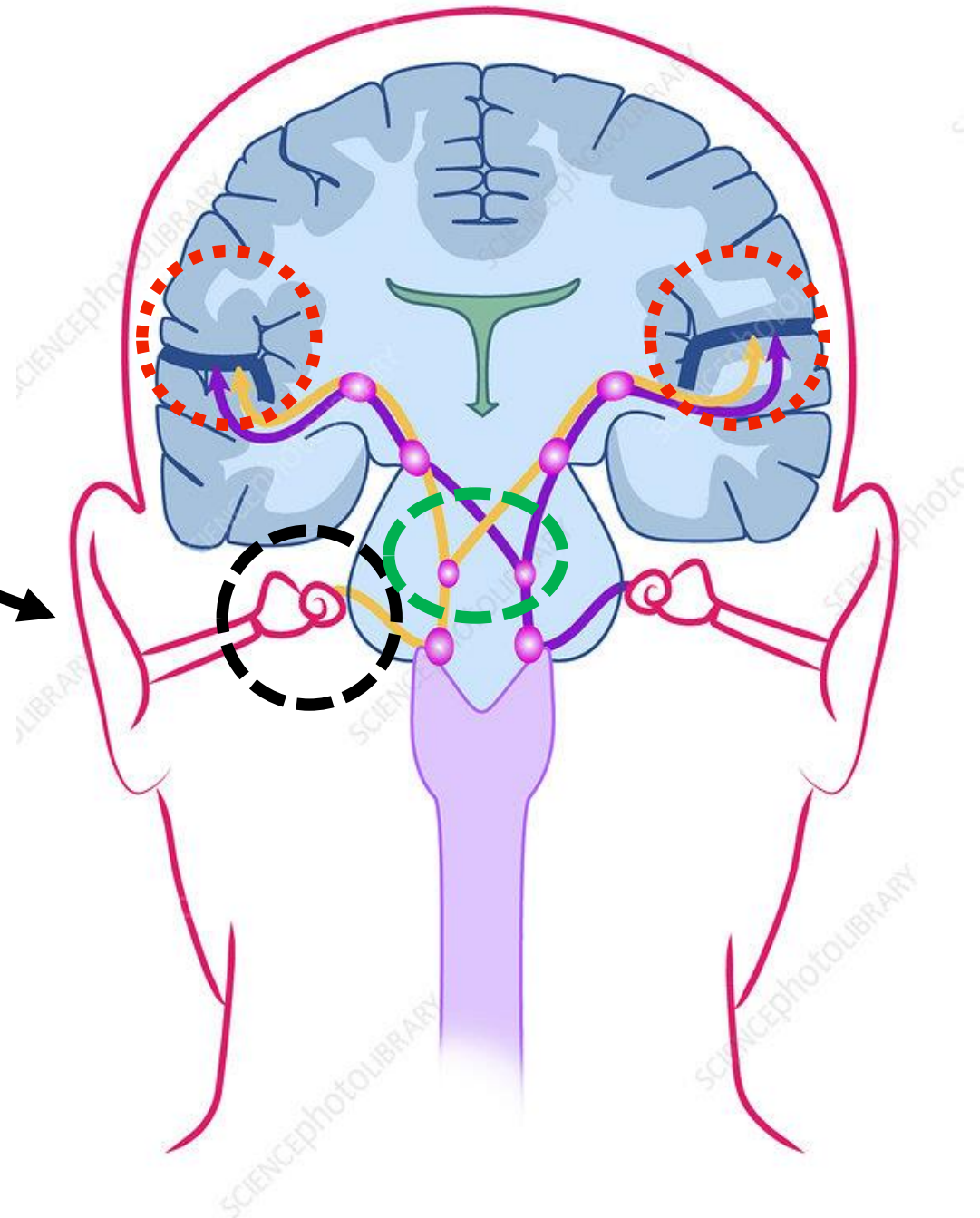


Sounds come in from all around us into our ears

Sounds are coded first in the inner ear – the cochlea

Sounds from the left and right ears are combined and integrated in the auditory brainstem

The final neural signal arrives in the cortex on the left and right sides



# Hearing versus Processing

- Hearing Tests
  - Mandated by federal and state law
  - Screenings done in all schools
- Raise your hand when you hear the “beep”
- Only measures ability to hear at normal soft levels
- Processing Tests
  - Not required in school-age children
  - No screenings done at school
- Can you make out what you are hearing under different conditions?
- Measures ability to perceive what is being heard to understand it



# Auditory Processing Tests

- Discrimination – can you identify the word?



- Figure-Ground – can you hear words in background noise?



- Memory – can you remember what you've heard?



- Binaural Integration – can you identify what you're hearing when the sounds at the two ears are competing?





# Common symptoms of processing problems

- Changes in behavior from quiet to noisy places
  - Distracted or upset by noises
  - Difficulty hearing when there is noise present
- Conversations difficult to follow, even in quiet
- Trouble following directions
- Disorganized and forgetful
- Misunderstands words; makes substitutions
- Struggles with spelling, writing and/or reading at school

# What to do if you suspect one of these?

- **Auditory processing and/or Vestibular concerns**

- Memphis Speech and Hearing Center  
University of Memphis, 4055 N. Park Loop
- Call 901-678-5858 for appointments



- **Visual processing concerns**

- The Eye Center  
Southern College of Optometry, 1245 Madison Avenue
- Call 901-722-3250 for appointments



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